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SENT VIA ELECTRONIC MAIL

December 19, 2019

Ms. Melanie Morash
U. S. Environmental Protection Agency (USEPA), Region 1
5 Post Office Square, Suite 100,
Mail Stop OSRR07-4, Boston, MA 02109-3912

RE: Response to Nobis' August 27, 2019 Technical Memorandum
Olin Chemical Superfund Site (OCSS; "Site") – Wilmington, MA

Dear Ms. Morash:

Transmitted herewith is a memorandum summarizing Olin's comments and responses to USEPA contractor's (Nobis) August 27 technical memorandum titled "Olin - Plant B/East Ditch Risk Evaluation V2".

Let us know if you have any questions.

Sincerely,
OLIN CORPORATION

James M. Cashwell
Director, Environmental Remediation

Enclosure

cc: Chinny Esakkiperumal (Olin)
Libby Bowen (Wood)

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USA
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Technical Memo

To: Chinny Esakkiperumal

From: Michael Murphy **Reviewer:** Elizabeth Bowen

Wood File No.: 6107190016

Date: 13 December 2019

Re: **Response to Memorandum "Olin – Plant B/East Ditch Risk Evaluation V2" dated August 27, 2019 and prepared by Nobis Group**

1.0 Introduction and Purpose

This Technical Memo has been prepared at Olin's request to provide comments on the August 27, 2019 Memorandum "*Olin – Plant B/East Ditch Risk Evaluation V2*" prepared by USEPA's contractor Nobis Group (Nobis). The stated objectives of the Nobis Memorandum were to "*summarize existing data and provide a preliminary evaluation of the potential human health and ecological risks mitigated by the operations at the former Plant B*" at the Olin Chemical Superfund Site (OCSS) located at 51 Eames Street, Wilmington, MA. Based on the introductory text of the Nobis Memorandum, it appears the general objective of that memorandum is to identify potential risks to human and environmental receptors associated with the East Ditch that might be created if operation of the LNAPL recovery and groundwater extraction/treatment system were to be terminated. The preliminary evaluation of risks in the Nobis Memorandum was conducted using groundwater analytical data and assuming that current groundwater concentrations could migrate unchanged to shallow groundwater along the East Ditch and East Ditch surface water.

It should be noted that Olin has committed to continue to operate Plant B to extract and treat groundwater in the Plant B area, and if this facility is removed in support of other remedial activities, to replace it with another treatment system. Our evaluation of human health and ecological risk has shown that there is no current risk in the East Ditch, and the continued operation of a groundwater extraction and treatment system will prevent future risks.

2.0 General Comments

The following are general comments to address the Nobis Memorandum and are valid even if the groundwater extraction system, that is currently operating at Plant B, were to stop operation.

1. Citing the 2008 Interim Response Steps Work Plan (IRSWP) (page 3-21), the Nobis Memorandum states "*This suggests that Olin has previously acknowledged that the East Ditch is an ecological receptor that requires some degree of concern and limitations on impacts*." That sentence implies that statements in the IRSWP objectives for the proposed Plant B shut down test included "*no adverse impacts on surface water quality*" and "*no visually observable adverse impacts on aquatic life in the East Ditch*" were an acknowledgement that the East Ditch is a valuable habitat. This was not the case, but rather an acknowledgement that the proposed Plant B shut down test would be conducted in a responsible

manner, that migration of LNAPL to the ditch would be unacceptable, and that degradation of the environment would not be an acceptable result for the shut down test.

In fact, the text on same page of the USEPA-approved IRSWP (p.3-21) clearly states the following regarding East Ditch: "*The East Ditch is a railway drainage ditch that is periodically maintained by the Massachusetts Bay Transit Authority (MBTA). Maintenance activities include grading of the ballast rock and mechanically clearing vegetation and sediment from the Ditch. Based on prior assessments, the East Ditch offers little if any valuable aquatic habitat*."

The outcome of the March 7, 2013 meeting with Olin, USEPA and MassDEP, was that the East Ditch would be evaluated in a separate Screening Level Ecological Risk Assessment (SLERA) at USEPA's recommendation. The findings of the SLERA were consistent with the description above, that the East Ditch offers little if any valuable aquatic habitat.

The SLERA included a habitat assessment and a wetlands functional assessment that confirmed the IRSWP description of the East Ditch habitat as poor with virtually no beneficial wetland function. In a letter dated July 28, 2015, USEPA approved the Final RI Report for OU1 and OU2 which included the Baseline Ecological Risk Assessment (BERA) and the East Ditch SLERA.

2. Section 2.0. We wish to respectfully point out that the human receptor exposure scenarios evaluated by Nobis are extremely conservative and are highly unlikely to occur in the East Ditch adjacent to the Property or in the area immediately adjacent to the East Ditch. The Memorandum evaluated hypothetical exposures for a utility worker and a trespasser that are inconsistent with the setting of a busy commuter rail line that is maintained using mechanical means.

   The utility worker was assumed to contact shallow groundwater adjacent to the East Ditch 8 hours per day in trenches for 20 workdays during a one-month period. However, the East Ditch is within the right of way of the MBTA commuter rail line. It is our understanding that the worker access to this area is allowed only with specific permission under a license agreement from the MBTA and there are very strict requirements concerning people being in the right of way since this is an active commuter rail line. A scenario of utility workers actually working in trenches that contain groundwater (no dewatering) would be extremely unlikely and if workers were present, consistent with a required health and safety plan, personal protective equipment to prevent contact with the groundwater would be required. In addition, for safety reasons, very complex arrangements would need to be made to either shut down the commuter rail line or have workers present near the rail line only intermittently to avoid safety hazards associated with the commuter trains. It is Olin's understanding that maintenance of the East Ditch is conducted using rail-mounted mechanical equipment and that there are no workers actually present in the ditch.

   The adolescent trespasser was assumed to contact surface water in the East Ditch 26 days per year for a period of 10 years; a total of 260 events. Under Massachusetts law it is illegal to trespass on MBTA property including the tracks and rail lines, and trespassers would be subject to arrest. It is extremely unlikely that an individual could commit a trespass of this extensive frequency and duration unnoticed by the transit workers or transit police and without legal consequences. In addition, the East Ditch has no recreational value (it is very shallow and narrow) and given the close proximity of the ditch to the active rail line (less than 25 feet from the rail line) and the frequent presence of high speed commuter trains moving through the area, it is a very dangerous and unlikely place for adolescents to frequent. There is no obvious reason for local adolescents to access the ditch and wade in it, certainly not on any kind of frequent basis.

   The Final OU1/OU2 Baseline Human Health Risk Assessment (BHHRA) evaluated a trespasser scenario and it also concluded, consistent with the Nobis Memorandum, that there would be no risks above CERCLA risk limits. The BHHRA in the OU1/OU2 RI was approved by USEPA. Any utility worker activity in the ditch would be conducted under a MBTA license agreement and health and safety plan per railroad requirements.

East Ditch surface water data from the OU2 RI and the IRSWP quarterly sampling of ISCO-3 do not indicate any substantial surface water impacts associated with potential migration of site signature analytes that have been detected at levels of potential concern in groundwater monitoring wells located upgradient of the East Ditch. This is discussed further in specific comments below.

3.0 Additional Comments Assuming Groundwater Extraction and Treatment Continues in the Plant B Area

1. The Nobis memorandum was intended to provide a preliminary evaluation of the potential human health and ecological risks mitigated by the on-going operations at the former Plant B area. As discussed below, the preliminary evaluation overestimates the potential migration of constituents in groundwater to the East Ditch surface water and adjacent shallow groundwater in the absence of Plant B operations. The preliminary evaluation is focused on assumed discharge of impacted groundwater (if the on-going operations were to be terminated) to the East Ditch surface water and to the shallow groundwater along the East Ditch and the associated potential exposures by human and environmental receptors. The memorandum states "Cessation of pumping may allow groundwater to migrate to the East Ditch adjacent to the Plant B area and to the South Ditch via groundwater migration and the confluence of these waterways". The preliminary risk evaluation concludes that for the assumed groundwater migration to the East Ditch and South Ditch, contaminants that may enter the East Ditch 1) may pose an unacceptable non-cancer risk to workers and 2) may pose risks to ecological receptors. The preliminary risk evaluation by Nobis was neither based on actual surface water data from the East Ditch adjacent to the 51 Eames Street Property nor actual shallow groundwater data immediately adjacent to the East Ditch. The preliminary risk evaluation results and conclusions were determined primarily by concentrations of analytes in groundwater samples from monitoring wells located to the west and southwest of Plant B in an area of the Property that may not contribute to the East and South Ditches currently or in the absence of Plant B operations. The Nobis memorandum did not appropriately consider the analytical data for multiple monitoring wells in the immediate vicinity of Plant B and the East Ditch when evaluating potential hypothetical future impacts to the East Ditch surface water and adjacent shallow groundwater.

   The available data for surface water in the East Ditch adjacent to the 51 Eames Street Property, as discussed in specific comments below, as well as groundwater from monitoring wells located immediately adjacent to the East Ditch, do not indicate human health or ecological risks of concern associated with the 51 Eames Street Property.

   Olin intends to continue Plant B operations until such time that operation of the system is no longer warranted and is being included as a component of alternatives that are being evaluated as part of the revised Interim Action Feasibility Study (IAFS) efforts. Therefore, the potential human health and ecological risks identified in the Nobis memorandum (based on groundwater data rather than surface water data) are not representative of current nor foreseeable future conditions in the East Ditch adjacent to the 51 Eames Street Property. Olin intends to monitor surface water in the East Ditch and groundwater on the Property in monitoring wells that are located to the west (upgradient) of the East Ditch to demonstrate current conditions.

2. The Nobis preliminary risk evaluation of potential East Ditch conditions under a scenario where the LNAPL recovery and groundwater extraction/treatment system is no longer operating is based on several highly conservative assumptions, that when combined, result in an unrealistic assessment of human health and environmental risk. Detailed comments with respect to these assumptions are included in the Specific Comments section below.

3. The LNAPL recovery system has been operating for more than two decades and decreasing LNAPL recovery rates over time suggest that successful operation of the system and volume of LNAPL present in the subsurface has been substantially reduced. Olin will continue Plant B operations until such time that

operation of the system is no longer warranted. There is no LNAPL migration to the East Ditch currently and none is expected in the foreseeable future.

4. Because the groundwater extraction/treatment system will continue to operate, no additional dissolved-phase contaminant migration to the ditch is expected. East Ditch surface water monitoring at ISCO-3 and the Remedial Investigation sampling and analysis from sample location EDSD/SW2 downstream of the Plant B area (data presented in Attachment 3-2 of the 2015 Screening Level Ecological Risk Assessment (SLERA)) indicates dissolved phase contaminant migration from groundwater to the East Ditch is currently not of concern. The two predominant risk drivers in the Nobis human health evaluation (1,1-biphenyl and diphenylether based on groundwater data) were not detected in any surface water samples collected in 2010, 2011, and 2012 from the East Ditch as shown in **Table 1**. Also, as shown in **Table 2**, the metals (including aluminum, iron, lead, and zinc) and ammonia identified in the Nobis evaluation of ecological risk as potentially of concern for East Ditch (again, based on groundwater data) were reported in surface water at levels below corresponding water quality criteria. In addition, other analytes present in the groundwater in the Plant B area such as trimethylpentenes and bis-2-ethylhexyl phthalate were either not detected or detected at low parts per billion concentrations in surface water samples from EDSD/SW2 as reported in Attachment 3-2 of the 2015 SLERA.

5. For the utility worker scenario, the identified shallow groundwater exposure point concentrations for the largest risk contributors dramatically overestimate the likely exposure point concentrations (EPCs) if the assumed and unlikely utility worker exposure scenario were to occur and the Plant B system is no longer operating. With the continued operation of the Plant B system, the overestimation of concentrations in shallow groundwater and surface water of the East Ditch used in the evaluation are even more conservative than for the construction worker or the trespasser. The utility worker hazard index values presented in the Nobis Memorandum are driven by groundwater exposure point concentrations of 1,1-biphenyl (HI = 7.0) and diphenylether (HI=36) related primarily to inhalation of vapors released from groundwater into a trench where a utility worker is working.

   Groundwater data from a wide area was selected by Nobis to represent groundwater with potential to discharge to the East Ditch surface water or with potential to be present as shallow groundwater between the Property and the East Ditch. Groundwater data associated with monitoring wells shown in "Figure 1: Plant B Well Locations" were used to derive the EPCs for shallow groundwater for the utility worker and for surface water for the trespasser (no dilution was assumed).

   The shallow groundwater EPCs for the utility worker and the surface water EPCs for the trespasser for 1,1,-biphenyl and for diphenylether were based on concentrations in monitoring well GW-15. The EPC for 1,1-biphenyl is the maximum detected concentration in all wells (27 ug/L from GW-15) and the EPC for diphenylether is the Upper Confidence Limit on the mean for all wells considered (148 ug/L, which is strongly influenced by the maximum detected concentration in all wells (260 ug/L from GW-15). The analytical results from GW-15 have a substantial impact on the EPCs used in the risk calculations used to assess potential impacts of groundwater discharge to the East Ditch in the absence of Plant B operations. However, this well is not representative of water quality that might discharge undiluted into the East Ditch if Plant B operations ceased. This well is located to the southeast of Plant B and is not under the influence of the Plant B system. Currently, groundwater from the location of this well flows roughly parallel to the East Ditch in a southeasterly direction. Groundwater currently flowing from the location of those wells towards the East Ditch would not be affected by cessation of Plant B operation.

   GW-15 has a five- foot screen installed from 19.5 to 14.5 feet below ground surface. It is considered a deep overburden monitoring well under OU3. Synoptic potentiometric maps presented in OU3 for deep overburden groundwater indicate groundwater in the vicinity of GW-15 does not move to the north. Rather it has, and continues to flow eastward. RI data collected from East Ditch clearly indicate that the risk drivers derived from GW-15 data have not impacted East Ditch sediments or surface water in such a

way as to result in unacceptable human or ecological risk. Therefore, to the extent this deep groundwater actually discharges to East Ditch, any chemical contribution is already reflected in East Ditch surface water quality (no concentrations above AWQC or other screening criteria). Inclusion of GW-15 data for that evaluation therefore is inappropriate.

However, there are multiple monitoring wells that are located closer to Plant B (and under the influence of Plant B operations) and closer to the East Ditch than GW-15 (and therefore more representative of potential future discharge to the East Ditch), and they have concentrations of these compounds that are substantially lower than those in GW-15. For example, the monitoring wells B-03, GW-100, GW-101, GW-102, GW-13, GW-14, and GW-52Sare closer to the East Ditch than monitoring well GW-15 and are under the influence of Plant B and are therefore more representative of water quality that might discharge to the East Ditch if Plant B was not operating. Therefore, data for 1,1-biphenyl and diphenylether from those wells are more predictive of potential discharge of groundwater to surface water and potential migration of shallow groundwater to the area immediately adjacent to the East Ditch (location of hypothetical trenching) than data from well GW-15. Overall, data from these wells indicate minimal potential for impact to shallow groundwater adjacent to the East Ditch and to surface water of the East Ditch. One exception is monitoring well GW-14, with a single detection of diphenyl ether at 140 ug/L and a non-detect (reporting limit of 4.5 ug/L). Biphenyl was not detected in samples from GW-14. **Table 3** identifies the groundwater data for 1,1-biphenyl and diphenylether from those wells closer to the East Ditch (identified above and highlighted in yellow in the table) as well as for wells further away from Plant B and the ditch (GW-15 and B-07A) which are not highlighted. Data for these compounds are not available for other wells that are further away from the ditch (B-17, B-5R, B-2, GW-100, and GW-102). Treatment system interceptor wells are not included here since groundwater is captured from these wells by the currently operating Plant B system and they are not monitoring wells and therefore are not sampled and analyzed for these chemical constituents.

Note that for the wells closer to Plant B and the East Ditch, groundwater concentrations of biphenyl (maximum detection 0.79 J ug/L) and diphenylether (maximum detection 140 ug/L at GW-14 (an anomalous result since the other sample for that well was a non-detect) and the second highest concentration of 8.1 ug/L at GW-101) are substantially lower than the corresponding concentrations in GW-15 (27 ug/L and 260 ug/L, respectively, for biphenyl and diphenylether). If the EPCs for the utility worker scenario had been calculated using the data from these wells under the influence of Plant B and close to the East Ditch, the HQ would have been below 1 for biphenyl and approximately 1 for diphenylether. The conclusion of the risk evaluation would have been that health risk would not be of concern.

The Nobis Memorandum assumes that groundwater from the property may migrate undiluted to shallow groundwater adjacent to the East Ditch and into surface water of the East Ditch. This assumption is obviously not appropriate for surface water under current conditions, since neither 1,1-biphenyl nor diphenyl ether was detected (reporting limits range from 4.5 ug/L to 5.3 ug/L and method detection limits typically 0.45 ug/L) in two surface water samples collected during the RI from each of the following East Ditch sampling locations: EDSD/SW0 and EDSD/SW1 (north of the 51 Eames Street Property), EDSD/SW2 (adjacent to the Property and downstream of Plant B), and EDSD/WS5 and EDSD/SW7 which are both downstream sample locations, plus SDBK-001(a Reference Location for the East Ditch). Although these compounds have been detected in groundwater from monitoring wells on the Property to the west of the East Ditch, they have not been detected in surface water. This further suggests the amount of groundwater actually discharging to East Ditch is limited. **Table 1** presents the data for 1,1-biphenyl and diphenyl ether for East Ditch surface water (there are no detections in any samples).

6. Section 3.2. Water quality in the East Ditch currently meets the ammonia site-specific AWQC (Criterion Chronic Concentration or CCC) of 15 mg/L (derived based on the absence of early life stage fish species and mussels and adjusted for pH and temperature). The Massachusetts Surface Water Quality Standards

at 314 CMR 4.05 (3)(b) identify specific criteria for Class B inland waters, including criteria for dissolved oxygen, temperature, pH, bacteria, solids, color and turbidity, oil and grease, and taste and odor. The Massachusetts Surface Water Quality Standards at 310 CMR 4.05 (5) identify additional minimum standards for all surface waters (regardless of their Classification). Those minimum standards address aesthetics, bottom pollutants or alterations, nutrients, radioactivity, and toxic pollutants. Identified standards for all surface waters for toxic pollutants are USEPA National Recommended Water Quality Criteria.

The Nobis Memorandum states that [some] groundwater concentrations of ammonia, aluminum, iron, lead, and zinc in the area of the East Ditch exceed the NRWQC (a.k.a. AWQC) and that average groundwater concentrations of ammonia, aluminum, iron, and lead exceed the NRWQC. However, the surface water analytical data for the East Ditch adjacent to the 51 Eames Street property (including the Plant B area) indicate that ammonia concentrations in surface water are well below the site-specific AWQC (CCC) of 15 mg/L and detected concentrations of aluminum, iron, lead, and zinc are at or below corresponding AWQC that were discussed in the Nobis memorandum. The surface water analytical data for these analytical parameters that were evaluated in the East Ditch SLERA are included in **Table 3** and are compared to corresponding AWQC. Please note that consistent with the Massachusetts Surface Water Quality Standards, the dissolved metals concentrations are most appropriate for comparison to the AWQC. These surface water data indicate that concentrations of ammonia, aluminum, iron, lead, and zinc do not exceed the AWQC for these analytical parameters, and with the continued operation of Plant B no exceedances of AWQC are expected in the foreseeable future. Monitoring of surface water adjacent to the Property will be conducted to confirm those conclusions for the foreseeable future.

In a letter to EPA dated 10/23/19, Olin proposed to add to the quarterly monitoring program seven shallow monitoring wells adjacent to the East Ditch and two surface water samples located in the East Ditch adjacent to the Property (in addition to ISCO-3 that is already part of the quarterly monitoring program. Groundwater and surface water samples collected from those locations will be analyzed for ammonia, BEHP, NDMA, sulfate, and total chromium. It is proposed that analysis for aluminum, iron, lead and zinc be added for the surface water samples in that program.

7. Section 3.2. of the Nobis memo: Comparison of groundwater concentrations from the sentinel wells close to the East Ditch directly to NRWQC is not consistent with conditions in the East Ditch. The Nobis at approach assumes groundwater for each monitoring well location (including GW-15 that is furthest away from the East Ditch) fully discharges directly to the East Ditch without any attenuation. This clearly will not occur because groundwater naturally attenuates due to dispersion and dilution as it migrates and it is further attenuated if and when it discharges to surface water. In addition, the prevailing groundwater flow is to the south and southeast, parallel to the East Ditch and not directly to the east. . Because of the safety issues and requirements for working next to an active rail line, the extent to which groundwater outside the influence of Plant B actually discharges to East Ditch has not been studied extensively. Based on comparison of surface water concentrations to those in groundwater adjacent to East Ditch, the actual contribution of groundwater to East Ditch surface water is small. Therefore, surface water quality data is the best measure of actual impacts on East Ditch surface water while the Plant B system continues to operate.

4.0 Conclusions

Even if the highly unlikely utility worker scenario could take place in the future, the Plant B groundwater extraction and treatment system will continue to operate.

- For groundwater on the eastern portion of the Property in the area of Plant B and further south, the prevailing flow direction is essentially south/southeast parallel to the East Ditch and not directly east towards the East Ditch.

- Available surface water data for the East Ditch adjacent to the Property suggest that shallow groundwater immediately adjacent to the East Ditch (essentially in contact with the surface water) is not of concern from a human health perspective (utility worker scenario).
- In addition, the groundwater data for the monitoring wells that are under the influence of Plant B and that are in close proximity to the East Ditch also indicate that shallow groundwater adjacent to the East Ditch is not and would not be of concern from a human health perspective (utility worker scenario).
- The surface water data for the East Ditch also indicate that organics, metals and ammonia concentrations are not an ecological concern (concentration are equal to or below water quality criteria).

5.0 References

AMEC Environment & Infrastructure, Inc. (AMEC), 2015a. Final Remedial Investigation Report, Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site, Wilmington, Massachusetts, July.

AMEC Environment & Infrastructure, Inc. (AMEC), 2013. Screening Level Ecological Risk Assessment East Ditch, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts, July. This document is Attachment 7 to the Baseline Ecological Risk Assessment that was included as Appendix N to the Final Remedial Investigation Report (AMEC, 2015a).

Commonwealth of Massachusetts, 2013. Massachusetts Surface Water Quality Standards at 314 CMR 4.00.

MACTEC, 2008. Final interim Response Steps Work Plan, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts, August 8.

USEPA, 2013. *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013,* EPA 822-R-18-002, April.

We look forward to further discussions on this topic and working with EPA to advance investigation and remediation efforts at this site.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.

Prepared by:

Michael Murphy
Principal Risk Assessor

Reviewed by:

Elizabeth T. Bowen
Associate Project Manager

TABLES

Table 1. Analytical Data 1,1-Biphenyl and Diphenyl Ether in East Ditch Surface Water
Olin Chemical Superfund Site
Wilmington, MA

Field Sample ID	Sample Date	Parameter	Final Result	Final Qual	Units
OC-SW-EDSD/SW0-XXX	12/13/2010	Biphenyl	4.5	U	ug/L
OC-SW-SD-EDSD/SW0-XXX	6/8/2011	Biphenyl	5	U	ug/L
OC-SW-EDSD/SW1 (EDBS5)-XXX	12/13/2010	Biphenyl	4.5	U	ug/L
OC-SW-EDSD/SW1(EDBS5)-XXX	6/8/2011	Biphenyl	4.8	U	ug/L
OC-SW-EDSD/SW2 (EDBS6)-XXX	12/13/2010	Biphenyl	4.5	U	ug/L
OC-SW-EDSD/SW2(EDBS6)-XXX	6/8/2011	Biphenyl	5	U	ug/L
OC-SW-EDSD/SW5 (EDBS11)-XXX	12/13/2010	Biphenyl	4.5	U	ug/L
OC-SW-EDSD/SW5(EDBS11)-XXX	6/8/2011	Biphenyl	5.3	U	ug/L
OC-SW-EDSD/SW7-XXX	6/18/2012	Biphenyl	4.7	U	ug/L
OC-SW-EDSD/SW7-XXX	11/6/2012	Biphenyl	4.9	U	ug/L
OC-SW-BK-SW/SD-001-XXX	12/13/2010	Biphenyl	4.5	U	ug/L
OC-SW-SDBK-001-XXX	6/8/2011	Biphenyl	5	U	ug/L
OC-SW-EDSD/SW0-XXX	12/13/2010	Diphenyl ether	4.5	U	ug/L
OC-SW-SD-EDSD/SW0-XXX	6/8/2011	Diphenyl ether	5	U	ug/L
OC-SW-EDSD/SW1 (EDBS5)-XXX	12/13/2010	Diphenyl ether	4.5	U	ug/L
OC-SW-EDSD/SW1(EDBS5)-XXX	6/8/2011	Diphenyl ether	4.8	U	ug/L
OC-SW-EDSD/SW2 (EDBS6)-XXX	12/13/2010	Diphenyl ether	4.5	U	ug/L
OC-SW-EDSD/SW2(EDBS6)-XXX	6/8/2011	Diphenyl ether	5	U	ug/L
OC-SW-EDSD/SW5 (EDBS11)-XXX	12/13/2010	Diphenyl ether	4.5	U	ug/L
OC-SW-EDSD/SW5(EDBS11)-XXX	6/8/2011	Diphenyl ether	5.3	U	ug/L
OC-SW-EDSD/SW7-XXX	6/18/2012	Diphenyl ether	4.7	U	ug/L
OC-SW-EDSD/SW7-XXX	11/6/2012	Diphenyl ether	4.9	U	ug/L
OC-SW-BK-SW/SD-001-XXX	12/13/2010	Diphenyl ether	4.5	U	ug/L
OC-SW-SDBK-001-XXX	6/8/2011	Diphenyl ether	5	U	ug/L

Method detection limit (MDL) was typically 0.45 ug/L for both Biphenyl and Diphenyl ether

Prepared by: JPK 10/24/19
Checked by: MJM 11/13/19

Table 2. Analytical Data Aluminum, Iron, Lead, Zinc and Ammoniain Surface Water - East Ditch Adjacent To Property
Olin Chemical Superfund Site
Wilmington, MA

				Aluminum		Iron		Lead		Zinc		Ammonia -N	
				mg/L		mg/L		mg/L		mg/L		mg/L	
Exposure Area	**Location**	**Sample Date**	**Field Sample ID**	Final Result	Final Qual	Final Result	Final Qual	Final Result	Final Qual	Final Result	Final Qual	Final Result	Final Qual
	National Recommended Ambient Water Quality Criterion:			0.087		1		0.0025		0.12		14	
East Ditch	EDSD/SW0	12/13/2010	OC-SW-EDSD/SW0-XXX	0.071	J	0.17		0.00035	J	0.053		0.1	U
Upstream	EDSD/SW0	6/8/2011	OC-SW-SD-EDSD/SW0-XXX	NA		NA		NA		NA		NA	
	EDSD/SW1 (EDBS5)	12/13/2010	OC-SW-EDSD/SW1 (EDBS5)-XXX	0.039	J	0.87		0.001	U	0.025	J	0.11	
	EDSD/SW1 (EDBS5)	6/8/2011	OC-SW-EDSD/SW1(EDBS5)-XXX	0.1	U	0.89		0.0001	U	0.05	U	0.1	U
East Ditch	SDBK-001	12/13/2010	OC-SW-BK-SW/SD-001-XXX	0.042	J	0.12		0.001	U	0.022	J	0.1	U
Reference Area	SDBK-001	6/8/2011	OC-SW-SDBK-001-XXX	1.1		6.7		0.014		0.023	J	0.4	
East Ditch	EDSD/SW2 (EDBS6)	12/13/2010	OC-SW-EDSD/SW2 (EDBS6)-XXX	0.068	J	0.73		0.00067	J	0.016	J	0.26	
Adjacent To	EDSD/SW2 (EDBS6)	6/8/2011	OC-SW-EDSD/SW2(EDBS6)-XXX	0.028	J	1		0.00013	U	0.0088	J	0.92	
Property	ISCO-3	11/8/2011		0.2/0.028								1.7	
	ISCO-3	11/16/2012		0.14 J/0.2 U								1.1	
	ISCO-3	3/22/2011		0.23/0.045 J								5.3	
	ISCO-3	5/16/2011		0.18/0.039 J								8.2	J
	ISCO-3	6/7/2012		0.028 J/0.025 U								1.8	
	ISCO-3	8/23/2011		.053 J/0.1 U								1.7	
	ISCO-3	8/23/2012		0.54/0.023 J								1.7	

Data obtained from 2013 Screening Level Ecologial Risk Assessment - East Ditch
xxx/yyy indicates results for unfiltered and filtered samples respectively

Prepared by: MJM 10/28/2019
Checked by:

Table 3. Analytical Data 1,1-Biphenyl and Diphenyl Ether In Groundwater
Olin Chemical Superfund Site
Wilmington, MA

Sample ID	Sample Date	Parameter	Result	Qualifier	Units
OC-B-03-XXX	11-Oct-10	Biphenyl	4.5	U	ug/L
OC-B-03-XXX	10-May-10	Biphenyl	4.8	U	ug/L
OC-B-07-A-XXX	11-Oct-10	Biphenyl	4.5	U	ug/L
OC-B-07-A-XXX	12-May-10	Biphenyl	4.9	U	ug/L
OC-GW-101-XXX	11-Oct-10	Biphenyl	4.5	U	ug/L
OC-GW-101-XXX	12-May-10	Biphenyl	0.79	J	ug/L
OC-GW-13-XXX	12-Oct-10	Biphenyl	4.5	U	ug/L
OC-GW-13-XXX	10-May-10	Biphenyl	4.5	U	ug/L
OC-GW-14-XXX	13-Oct-10	Biphenyl	4.5	U	ug/L
OC-GW-14-XXX	13-May-10	Biphenyl	4.5	U	ug/L
OC-GW-15-XXX	12-Oct-10	Biphenyl	27	J	ug/L
OC-GW-15-XXX	13-May-10	Biphenyl	6.4		ug/L
OC-GW-17S-XXX	19-Oct-10	Biphenyl	4.5	U	ug/L
OC-GW-17S-XXX	19-May-10	Biphenyl	4.5	U	ug/L
OC-GW-52S-XXX	13-Oct-10	Biphenyl	4.5	U	ug/L
OC-GW-52S-XXX	13-May-10	Biphenyl	4.5	U	ug/L
OC-B-03-XXX	11-Oct-10	Diphenyl ether	4.5	U	ug/L
OC-B-03-XXX	10-May-10	Diphenyl ether	4.8	U	ug/L
OC-B-07-A-XXX	11-Oct-10	Diphenyl ether	4.5	U	ug/L
OC-B-07-A-XXX	12-May-10	Diphenyl ether	4.9	U	ug/L
OC-GW-101-XXX	11-Oct-10	Diphenyl ether	4.5		ug/L
OC-GW-101-XXX	12-May-10	Diphenyl ether	8.1		ug/L
OC-GW-13-XXX	12-Oct-10	Diphenyl ether	2.4	J	ug/L
OC-GW-13-XXX	10-May-10	Diphenyl ether	4.5	U	ug/L
OC-GW-14-XXX	13-Oct-10	Diphenyl ether	140		ug/L
OC-GW-14-XXX	13-May-10	Diphenyl ether	4.5	U	ug/L
OC-GW-15-XXX	12-Oct-10	Diphenyl ether	260		ug/L
OC-GW-15-XXX	13-May-10	Diphenyl ether	26		ug/L
OC-GW-17S-XXX	19-Oct-10	Diphenyl ether	4.5	U	ug/L
OC-GW-17S-XXX	19-May-10	Diphenyl ether	1.2	J	ug/L
OC-GW-52S-XXX	13-Oct-10	Diphenyl ether	4.5	U	ug/L
OC-GW-52S-XXX	13-May-10	Diphenyl ether	4.5	U	ug/L

Method detection limit (MDL) was typically 0.45 ug/L for both Biphenyl and Diphenyl ether
Yellow shading indicates monitoring wells under influence of Plant B and close to East Ditch
Lack of shading indicates monitoring wells not under influence of Plant B and/ or close to East Ditch

Prepared by: MJM 10/24/19
Checked by: